AN OPTIMAL CONTROL DESIGN FOR AIRCRAFT ANTISKID BRAKE CONTROL SYSTEMS

ABSTRACT OF THE DISCLOSURE

The optimal control design for antiskid brake control uses a discrete Kalman filter scheme in combination with a conventional aircraft brake control system, comprising sensors for measuring a speed of a wheel and brake torque, and for providing output signals indicative of the speed and torque values, and an optimal antiskid braking controller. The optimal antiskid brake controller includes a wheel speed filter, a reference velocity module, an optimal controller, and an integrator module. The optimal controller includes a discrete Kalman regulator utilizing a discrete Kalman filter, which compels the wheel velocity to quickly converge to the reference velocity, while the integrator produces appropriate antiskidding control and compensates for low frequency torque disturbances. The discrete Kalman filter estimates brake pressure, and the difference between the wheel velocity and a reference velocity, and these estimated states are regulated by a control feedback gain matrix. The weighting matrices and all gains are precalculated, and performance of the controller can be improved by adjustment of these factors. The optimal brake control design methodology can also be applied to an electric brake control system with slight modification of dynamic model parameters, gain values and weighting factors. This optimal brake control scheme provides for improvement of antiskid brake efficiency, and control tuning of a conventional aircraft brake control system.